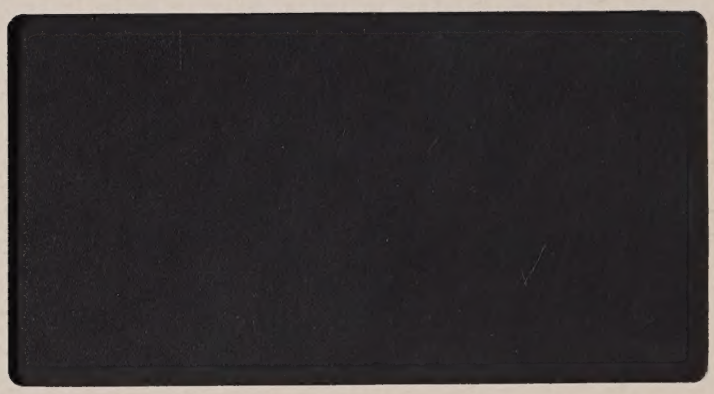
POLARAD

HANDBOOK OF OPERATING AND MAINTENANCE INSTRUCTIONS

POLARAD ELECTRONIC INSTRUMENTS,
DIVISION OF POLARAD ELECTRONICS CORPORATION
34-02 QUEENS BLVD., LONG ISLAND CITY 1, N. Y.



POLARAD

INSTRUCTION MANUAL

PRECISION NOISE GENERATOR MODEL N-1

THIS HANDBOOK COVERS EQUIPMENT
PREFIXED WITH SERIAL NOS. 101
THROUGH 170 AND RUN 6-1 AND UP.

POLARAD ELECTRONIC INSTRUMENTS
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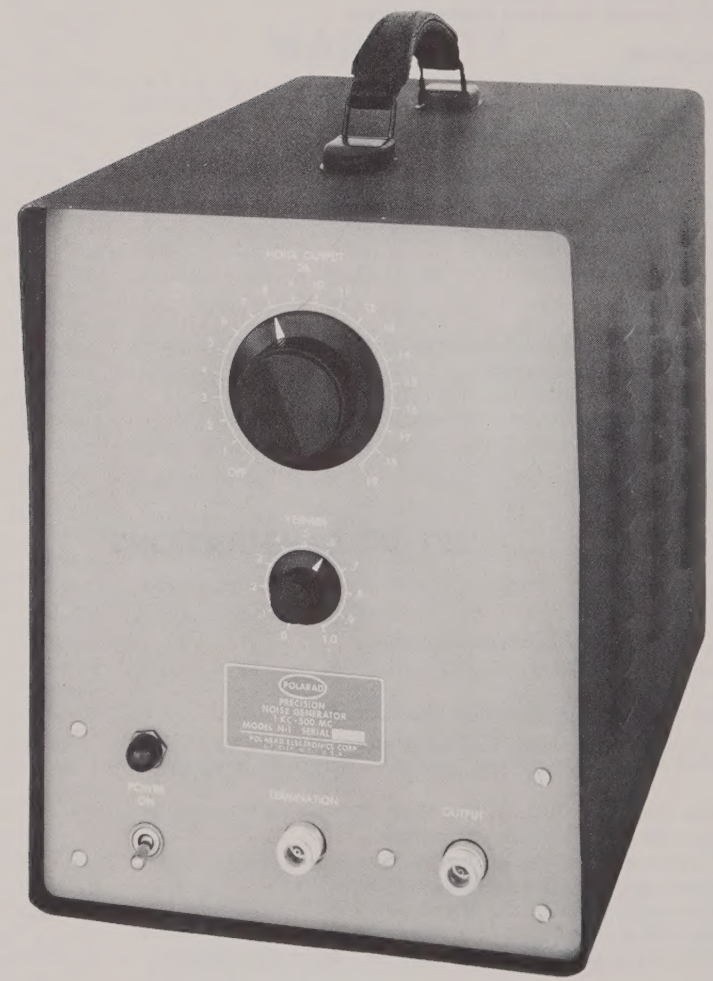


Figure 1-1. Model N-1 Precision Noise Generator

SECTION I
INTRODUCTION

1-1. SCOPE OF MANUAL

This manual provides information for operating and maintaining Polarad's Model N-1 Precision Noise Generator. These instructions also include theory of operation, trouble shooting procedures, and a complete electrical parts list.

1-2. PURPOSE OF EQUIPMENT

The Model N-1 Precision Noise Generator, shown as figure 1-1, is used to measure noise figures of vacuum-tube amplifiers, transistor amplifiers, receivers, and other devices or networks which operate in the frequency range from 1 kc to 500 mc. The resulting measurements are expressed in "db above thermal noise" at the reference temperature (290°K = 62.6°F).

1-3. GENERAL DESCRIPTION

The unit is small and compact, and has simple controls. Its noise output range is covered in steps of 1 db from 0 to 19 db by means of a rotary attenuator switch on the front panel. An interpolation control, variable between 0 and 1 db, permits fine adjustment of the noise output to the desired fraction of a decibel, and extends the noise range to 20 db. The sum of the values indicated by these two controls is the total noise output.

The instrument is entirely self-contained, and includes well-regulated power supplies. Special provision is made for shielding its temperature-limited, noise generator diodes.

1-4. GENERAL PHYSICAL CHARACTERISTICS

Dimensions	8-1/2 in. wide by 11 in. high by 15 in. deep.
Finish	Green baked enamel.
Weight	24 lbs.

1-5. ACCESSORIES SUPPLIED (Figure 1-2)

50-ohm coaxial termination.
6000 mmf blocking capacitor, coaxial construction.

1-6. GENERAL ELECTRICAL CHARACTERISTICS

Noise Figure Range	1 to 20 db.
Switching Steps	1 db.
Fine Adjust	0 to 1 db interpolation.
Frequency Range	1 kc to 500 mc, with termination of 50 ohms.
Accuracy	±0.25 db.
Output Impedance	50 to 10,000 ohms, depending on termination.
Fuse Ratings	One 3 amps, 125V, 3AG. Two 2 amps, 125V, 3AG.
Input Power Requirements	115/230V, 50 to 60 cps, 130 watts.
Tube Complement	See table 1-1.

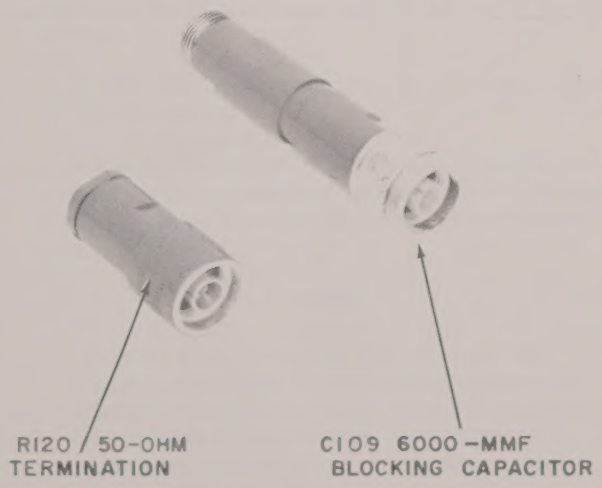


Figure 1-2. Accessories Supplied

OUT PUT AT 1 DB SETTING IS
2.04 x 10⁻¹⁷ mw per cycle.

TABLE 1-1. TUBE COMPLEMENT

Reference Designation	Type	Function
V101	5Y3	Rectifier, -100 volts regulated B- supply.
V102	6AU5	Pass tube, -100 volts regulated B- supply.
V103	6AN8	D-c amplifier (-100 volts regulated B- supply) and chopper amplifier.
V104	6X4	Rectifier, +100 volts reference supply, +300 volts unregulated B+ supply.
V105	6AQ5	Pass tube, +100 volts reference supply.
V106	6X4	Rectifier, -108 volts reference supply.
V107	12AX7	D-c amplifier, +100 volts reference supply.
V108	0B2	Voltage regulator, -108 volts reference supply.
V109	12AX7	Amplifier
V112	Sylvania 5722	Noise diode.
V113	Sylvania 5722	Noise diode.
V114	Sylvania 5722	Noise diode.
CR101	Sarkes-Tarzian 10LF	Silicon rectifier, diode filament supply.
CR102	Sarkes-Tarzian 10LF	Silicon rectifier, diode filament supply.
Q101	2N456	Filament voltage control amplifier.
Q102	2N456	Filament voltage control amplifier.
Q103	2N456	Filament voltage control amplifier.

SECTION II
OPERATION

2-1. INPUT VOLTAGE

The instrument may be operated on either 115 or 230 volts, 50 to 60 cps, depending upon the position of slide switch S102, located on rear of the chassis. See figure 4-2. For 115-volt operation, S102 places the primary windings of power transformer T101 in parallel across the 115-volt line. In 230-volt operation, the windings are connected in series with each other across the 230-volt line. Normally, switch S102 is set at the factory for 115-volt operation.

2-2. POWER SWITCH

The unit is turned on and off by means of power switch S101, located at the bottom left of the front panel. POWER ON lamp DS101, immediately above the switch, indicates when the power is on.

2-3. MEASUREMENT OF NOISE FIGURE

Noise figure may be defined as the amount of introduced noise required to produce an output 3 db higher than the output when no input signal is applied.* This value is indicated directly by the Model N-1 Precision Noise Generator.

To perform noise figure measurements with the instrument, follow the procedure outlined below. Figure 2-1 shows the test set-up.

a. Procedure for Measuring Noise Figure.

1. Connect a termination to the TERMINATION jack of the Model N-1 having the same value as the input impedance of the device under test. Since an input impedance of 50 ohms is most often encountered, this value of termination is supplied with the instrument. For other values, see paragraph 2-3b.

2. Connect a blocking capacitor to the OUTPUT jack of the noise generator. If the termination is 50-ohms and the frequency used is between 10 and 500 mc the 6000 mmf blocking capacitor can be used.

* Note: This definition is equivalent to the more often cited definition:

$$F = \frac{S_I/N_I}{S_O/N_O}$$

Where: S_I/N_I = Available signal-to-noise power ratio at input.

S_O/N_O = Available signal-to-noise power ratio at output.

For other frequencies, see table below. For other termination impedances, see paragraph 2-3c.

NOTE

Both a termination and a blocking capacitor must be used for all measurements.

TABLE 2-1. RECOMMENDED VALUES OF BLOCKING CAPACITOR (1 KC - 500 MC)

Value of Blocking Capacitor	Frequency Range
6000 uuf	10 mc - 500 mc
0.05 uf	1 mc - 10 mc
0.5 uf	100 kc - 1 mc
5 uf	10 kc - 100 kc
50 uf	1 kc - 10 kc

NOTE: All values suggested for use with 50-ohm termination.

3. Using shielded cable, connect the input of the device under test to the output of the blocking capacitor.

4. Connect a meter of adequate sensitivity to the output of the device under test.

NOTE

If a meter which reads db directly is not available, a voltage measuring device can be used.

5. Set the NOISE OUTPUT control of the noise generator to the OFF position, and the VERNIER control to zero.

6. With the device under test in operation, record the meter reading.

7. Adjust the NOISE OUTPUT and VERNIER controls of the noise generator until the meter indicates a reading that is exactly 3 db higher than the output obtained in step 6.

NOTE

Because of the time constants involved, the meter may not show instantaneous response to changes of control settings. Thus, it is advisable to wait a moment after each setting to make sure that the meter pointer has reached its final position. If a voltage measuring device has been used, multiply the meter reading of step 6 by 1.414 to obtain meter reading for step 7.

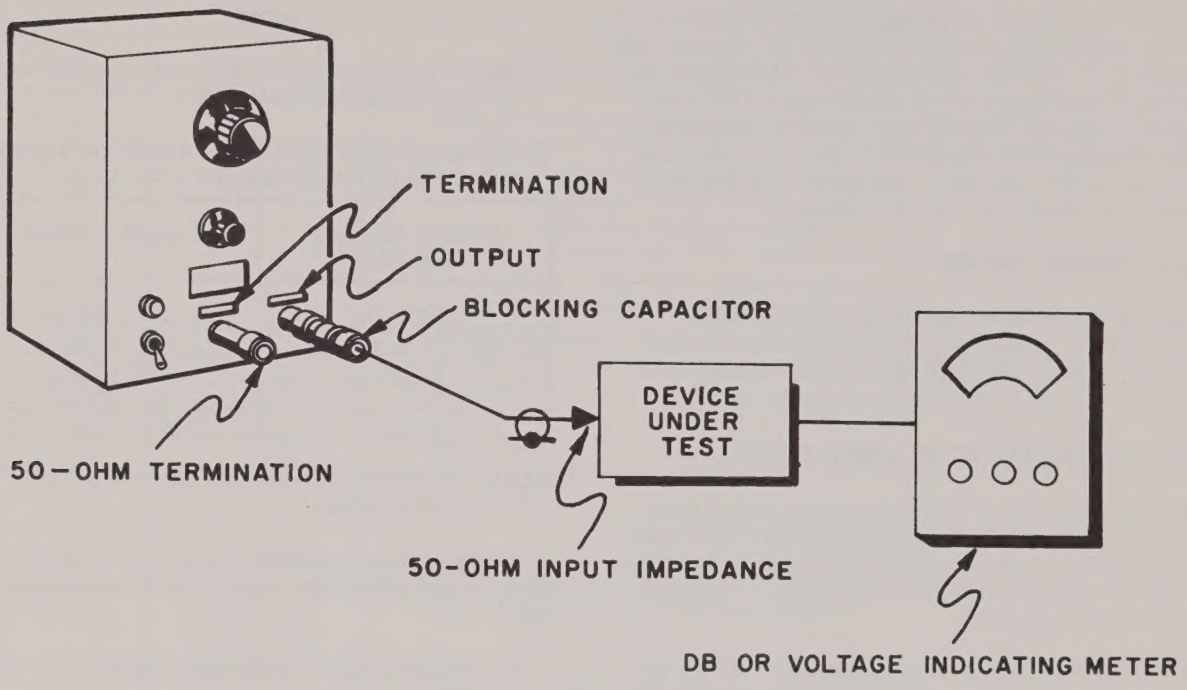


Figure 2-1. Test Set-Up for Noise Figure Measurement

8. Read the output level by adding the indications of the NOISE OUTPUT and VERNIER controls. The sum is the noise figure (in decibels) of the device under test. Normal temperature variation has a negligible affect on the accuracy of the Model N-1.

b. Construction of Other Terminations. For accurate measurements of a noise figure, it is necessary that the termination have the same impedance as the input of the network under test. If the required termination value is other than 50 ohms, it will be necessary to construct a special termination.

For terminations up to 200 ohms, it is possible to modify the 50-ohm termination supplied with the instrument by replacing the 50-ohm disc resistor in the termination with the same type of disc resistor having the required value. These disc resistors are available in values up to 200 ohms from Mepco, Incorporated, Morristown, N.J., and are known as Type C500D.

For terminations between 200 and 10,000 ohms, an Allen Bradley, 1/2 watt, composition resistor mounted in a Type N connector may be used. It should be noted, however, that when terminations greater than 50 ohms are used, the high-frequency limit of noise output is reduced, because the upper frequency limit is a function of the termination value. Thus, the upper limit will not be as high as 500 mc.

c. Use of Other Blocking Capacitors. The blocking capacitor supplied is 6000 mmf, and can be used with a 50-ohm termination for frequencies between 10 and 500 mc. For operation at lower frequencies a larger blocking capacitor is required, but coaxial construction is not necessary. Therefore, conventional capacitors may be used. Typical values that can be used with a 50-ohm termination at lower frequencies are given in table 2-1. For higher values of termination, proportionally lower values of blocking capacitor should be used. The value must be chosen such that the capacitive reactance is very much lower than the termination impedance at the frequency of operation. The standard formula for calculating capacitive reactance is used in determining the value:

$$X_C = \frac{1}{2\pi f C}$$

where: X_C = Capacitive reactance (ohms)

π = 3.1416

f = Frequency of operation (cps)

C = Chosen value of capacitance (farads)

SECTION III
PRINCIPLES OF OPERATION

NOTE

All references are made to the schematic diagram of figure 4-7.

3-1. NOISE DIODES

Three temperature-limited noise diodes, V112, V113, V114, are connected in parallel to generate the required noise output. The level of noise output is governed by the voltage applied to the diode filaments, since the filament-to-plate currents (and hence, the noise output) are determined by the voltage on the filaments when the plate voltage is constant. The three diode filaments are connected in series with each other.

Diode capacitances are disposed along a three-section, low-pass filter which allows a bandwidth up to 500 megacycles. The upper frequency limit of operation is determined by the transit time of the electron beam in the noise diodes and the cutoff frequency of the low-pass filter. The cutoff frequency of the filter was designed to be approximately the same as the frequency at which transit time effects start to occur. Ferrite beads FE101 through FE104 filter out unwanted rf signals from the diode filament circuit. Capacitors C122 through C130 bypass unwanted signals from the diode filaments to ground.

3-2. FEEDBACK CIRCUIT

Noise output is accurately maintained at the set level by a feedback circuit, shown in the simplified block diagram of figure 3-1. A portion of the output signal is fed back through resistors R123 and R137 to the output of NOISE OUTPUT control attenuator AT101, where it is added to a predetermined portion of the +100 volts d-c reference voltage.

Chopper CH101A mechanically interrupts this d-c signal and converts it into a square wave which is then applied to the input of high-gain amplifier V109, a twin-triode with both stages connected in cascade.

The output of this amplifier is further amplified by V103B, the triode section of a triode-pentode, and is transformer-coupled to the transistorized, filament-voltage control amplifiers, Q101 and Q102. Before reaching the transistors, the signal is reconverted from square wave to dc by chopper CH101B, which is mechanically synchronized with chopper CH101A. As the result of this conversion-and reconversion process, a very stable high-gain amplifier is obtained which is sensitive to the slightest error voltages occurring across the termination. Compensating adjustments in filament voltage are made by power transistors Q101 and Q102 so that the noise output is accurately maintained at the level set by

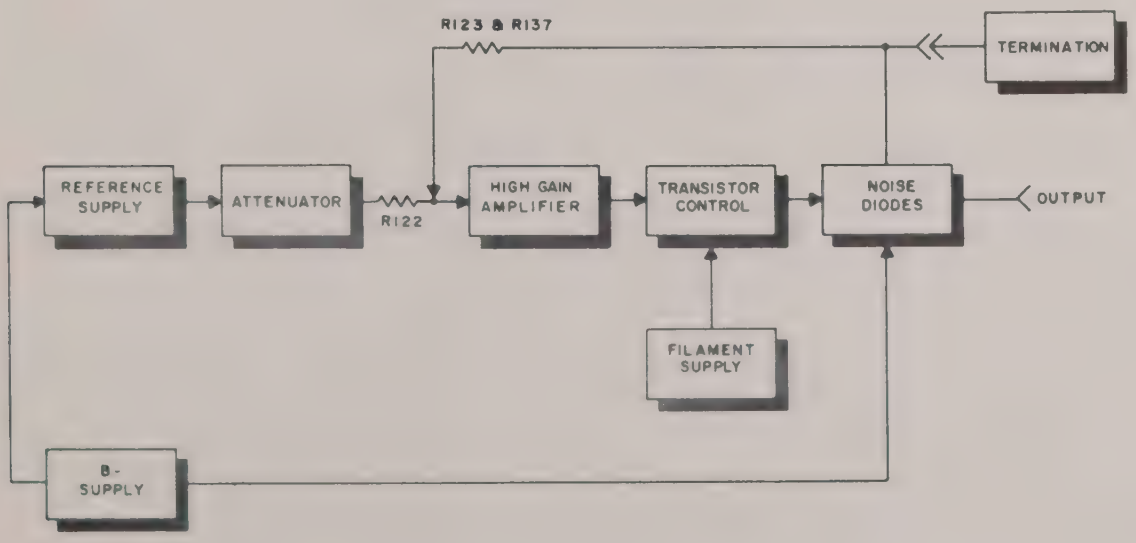


Figure 3-1. Model N-1 Precision Noise Generator, Simplified Block Diagram

the front-panel controls. Q102 is in series with the diode filaments and controls the amount of current flowing through them. In this way, it controls the filament voltages and hence, noise output. Its action is, in turn, governed by transistor amplifier Q101, which is indirectly controlled by the setting of attenuator AT101.

3-3. POWER SUPPLIES

a. +100 Volt Regulated Reference Supply. The +100 volt reference supply provides the stable reference voltage required across the series combination of VERNIER control R119, resistor R121, and attenuator AT101. It also provides B+ voltage for amplifier V103B, and screen voltage for V102.

Basically, this supply consists of rectifier V104, pass tube V105, twin-triode amplifier V107, and associated circuitry. A-c input to the rectifier tube is obtained from one of the center-tapped secondary windings of transformer T101 (taps 8 and 10). The output of the rectifier passes through pass tube V105 to the load. When small changes in input voltage or load current occur, the plate-to-cathode resistance of the regulator tube is automatically adjusted by the action of sensitive amplifier V107 so as to maintain a practically constant output voltage across the load.

Adjustment of potentiometer R110 on the rear of the chassis (figure 4-2) establishes the normal resistance of pass tube V105; therefore, this control is used to set the value of load voltage which the regulator is to maintain.

b. -108 Volt Reference Supply. The -108 volt reference supply provides negative reference and bias voltage for the +100 volt- and -100 volt power supplies. It includes half-wave rectifier V106, voltage-regulator tube V108, and a conventional r-c filter circuit to smooth out ripple.

A-c voltage from tap 10 of transformer T101 is applied between the cathode of V106 and chassis ground. The negative d-c output voltage is taken off the plates of V106. Filtering is provided by an r-c circuit consisting of R112 and C105, followed by a second-stage filter consisting of R113, C106, and R114.

The filtered output is applied across neon-glow tube V108, which acts as a voltage regulator.

c. -100 Volt Regulated B- Supply. This supply provides a stable B- output for the noise diodes. The output voltage is sufficiently high to ensure that temperature-limited conditions are maintained over the full range of diode current.

A negative voltage is used on the diodes' filaments so that the plates can be kept at the approximate voltage level of chassis ground. This arrangement is desirable in order to eliminate the possibility of shock hazards, because direct connections to the plates are available through the front panel OUTPUT and TERMINATION jacks.

The regulated B- supply consists basically of rectifier V101, pass tube V102, and d-c amplifier V103A. A-c input is obtained from taps 5 and 7 of power transformer T101. Tap 6, the center-tap of the winding, is the output of this negative supply.

The circuit is similar to the +100-volt regulated supply circuit in that it uses a full-wave rectifier, a series regulator tube, and a sensitive amplifier which automatically adjusts the plate-to-cathode resistance of the regulator tube in order to maintain a practically constant output voltage.

The basic difference between the two circuits is that in the B+ reference circuit, the center-tap (pin 6) of the transformer secondary winding is grounded and the output is taken from the cathode of the pass tube, whereas in the B-supply the cathode of the pass tube is grounded while the output is taken from the center-tap of the transformer secondary winding. Another minor difference is that a single stage, high-gain pentode is used as the amplifier in the B- supply, whereas a twin-triode amplifier is used in the positive reference supply.

d. +300 Volt Unregulated Supply. The +300 volt unregulated supply provides B+ voltage for tubes V103A and V109. It consists of rectifier V104 (which also serves as rectifier for the +100 volt regulated reference supply), resistor R115, and filter capacitors C108A and C108C.

e. A-c Filaments Supply. Taps 16 and 17 of power transformer T101 provide 6.3 volts ac for the filaments of V102, V103, V104, V105, V106, V107, V109, and for the operation of chopper CH101 and pilot light DS101.

A separate secondary winding, taps 11 and 12, provides 5.0 volts ac for the filament of rectifier V101.

f. Diode-Filaments Supply. A diode-filament supply of approximately 20 volts is required, since the filaments of V112, V113, and V114 are connected in series. A-c input voltage is taken from one of the center-tapped secondaries of transformer T101. Two silicon diodes are employed in a conventional full-wave rectifier circuit. The rectifier plates are connected to transformer taps 13 and 15, respectively, while the cathodes are connected together. The output is taken across the cathodes and the center tap, and is filtered by smoothing capacitor C112. Fuse F103 protects against short circuits and overloads. The load consists of the three diode filaments and control transistor Q102, all in series. The supply is negatively referenced at -100 volts.

SECTION IV
MAINTENANCE

4-1. TROUBLE-SHOOTING

In the event that the equipment does not operate after a reasonable period of use, the most probable cause is tube failure. In order to check and replace the tubes it is necessary to remove the chassis from the case by unscrewing the two large speed-nut screws at the rear of the instrument.

Before removing the case, however, it is advisable to look for some of the immediately obvious other causes mentioned in the Trouble-Shooting Chart (table 4-1), such as defective power cord or plug, defective termination, blown fuses, etc.

If none of these causes is apparent, inspect the tubes, noting if all are lit. In particular, observe noise diodes V112, V113 and V114. Since the filaments of all three diodes are connected in series, the failure of one will prevent all three from lighting. Also, if protective fuse F103 has "blown", the diode filaments cannot light. Use a tube tester to check suspected tubes, or replace them by substituting a like tube that is known to be in good condition.

If, after checking, all the tubes are found to be satisfactory and the equipment still does not operate, localize the trouble as discussed in the following paragraph.

TABLE 4-1. TROUBLE-SHOOTING CHART

Symptom	Probable Cause
1. Equipment does not operate; pilot light does not light.	Defective a-c line cord or plug. Blown fuse F101 or F102.
2. Equipment does not operate; pilot bulb lights.	Blown fuse F103. Defective filament in one of noise diodes, V112, V113, V114. Defective vacuum tube. No termination or defective termination.
3. Pilot bulb does not light; equipment appears to function normally.	Defective pilot lamp.
4. Equipment does not operate on 115-volts; pilot bulb is very dim.	Switch S102 is in the 230 VOLTS position instead of the 115 VOLTS position.
5. Full output is not exactly -5.0 volts.	+100 volts reference supply is improperly regulated. See paragraph 4-4 for correction.
6. Output does not increase or decrease in steps of exactly 1 db.	Defective attenuator AT101. See paragraph 4-5.

4-2. TROUBLE LOCALIZATION AND ISOLATION

Using as references the schematic of figure 4-7 and table 4-2, "Table of Operating Voltages," begin a systematic check of each stage, starting with the power supply circuits. A vacuum-tube voltmeter is preferred for all voltage measurements, but it is possible to use a volt-ohmmeter for those measurements not indicated by an asterisk in table 4-2. The NOISE OUTPUT and VERNIER controls of the noise generator should be set at 10 db while performing all measurements so that results can be compared with the data of table 4-2. Such a comparison should indicate very quickly if a stage or circuit is functioning correctly.

Other check points, in addition to those given in table 4-2, are as follows:

There should be an output of approximately 15 to 20 volts dc across capacitor C112 in the diode-filament supply circuit. (Be careful to observe the polarity shown in figure 4-7 when connecting the meter.)

Between the variable arm of attenuator AT101 and chassis ground there should be a voltage of 0 to +5 volts dc. This voltage should vary from one limit to the other as the attenuator control is varied from 0 to 19 db.

At pin 3 of chopper CH101A there should be a low amplitude square wave. On the grid of V103B (pin 2) there should be an amplified square wave. At pin 6 of chopper CH101B the square wave should be rectified to dc.

Across capacitors C119 and C132 there should be a

TABLE 4-2. OPERATING VOLTAGES

Socket No.	Plate			Screen			Control Grid			Cathode			Filaments		
	Pin	Volts	Ohms	Pin	Volts	Ohms	Pin	Volts	Ohms	Pin	Volts	Ohms	Pin	Volts	Ohms
XV101	4 6	220AC 220AC	∞ ∞										2 8	190 190	∞ ∞
XV102	5	190	∞	8	100	10K	1	-19*	∞	3	0	0			
XV103A	6	-19	∞	7	0	0	8	-111*	420K	9	-108	∞			
XV103B	1	100	∞				2	8.9*	1 MEG	3	0	0			
XV104	1 6	225AC 225AC	110 110							7	305	∞			
XV105	5	305	∞	6	305	∞	7	83*	∞	2	100	10K			
XV106	1 6	-210 -210	∞ ∞							7	225AC	110			
XV107	1 6	83* 51*	∞ 110K				2 7	50* -.25*	77K 580K	3 8	51* 0	110K 0			
XV108	1 5	0	0							2 4 7	-108	260K			
XV109	1 6	78* 92*	∞ ∞				2 7	-1* -.8*	∞ ∞	3 8	0 0	0 0			
XV112	1 6	.5	50										3 4	-112 -108	
XV113	1 6	.5	50										3 4	-116 -112	
XV114	1 6	.5	50										3 4	-119 -116	
	Emitter			Base			Collector								
Q101	119		∞	119		∞	128		∞						
Q102	119		∞	119		∞	128		∞						

* Voltage reading taken with VTVM.

All readings taken with NOISE OUTPUT controls set at 10 db. - All voltages dc, unless otherwise specified.

d-c voltage which varies according to the setting of attenuator AT101. (Be careful to observe the polarities shown in figure 4-7 when connecting the meter.)

Obviously, if there is a discrepancy at any of the check points, the trouble is in the preceding stage or in the local area of the check point.

4-3. GENERAL MAINTENANCE

Other than normal care and periodic inspection, the Model N-1 Precision Noise Generator requires little routine maintenance. However, its accuracy should be carefully checked from time to time using the procedure outlined below. In particular, it is recommended that such checks be performed each time that tubes are replaced, especially when power supply tubes such as V105 are replaced. If necessary, the instrument should be recalibrated as outlined below.

4-4. ACCURACY CHECK AND CALIBRATION PROCEDURE

1. Connect the 50-ohm termination to the TERMINATION jack.

2. Connect the positive probe of an accurately calibrated d-c meter* to chassis ground.

3. Connect the negative probe of the d-c meter directly to the OUTPUT jack. A blocking capacitor should not be used.

4. Set the N-1 Generator for an output of 20 db (maximum output).

5. Measure the output on the d-c meter. If the generator is accurately calibrated, the meter will read exactly 5.0 volts (actually -5.0 volts).

6. If the meter does not read exactly -5.0 volts, adjust potentiometer R110, located at the rear of the instrument (figure 4-2), until it reads exactly -5.0 volts. Because of the time constants involved, it is advisable to wait a few moments after each adjustment of R110 to make sure that the meter pointer has reached its final position.

7. Check attenuator accuracy.

4-5. CHECKING ATTENUATOR ACCURACY

Once the instrument has been accurately calibrated following the procedure outlined above, check the accuracy of the attenuator control by switching from 20 db down to 1 db, in steps of 1 db, and comparing meter readings with the data given in table 4-3. If the results are not within 0.25 db of the given data, AT101 should be replaced.

* **NOTE:**

The accuracy of calibration of the Model N-1 Precision Noise Generator depends upon the accuracy of the meter used. Thus, it is mandatory that the test meter be accurately calibrated.

TABLE 4-3. DATA FOR CHECKING ATTENUATOR ACCURACY

NOISE OUTPUT DB	METER READING VOLTS DC
20	-5.00
19	-3.97
18	-3.16
17	-2.51
16	-1.99
15	-1.58
14	-1.26
13	-1.00
12	-0.79
11	-0.63
10	-0.50
9	-0.397
8	-0.316
7	-0.251
6	-0.199
5	-0.158
4	-0.126
3	-0.100
2	-0.079
1	-0.063

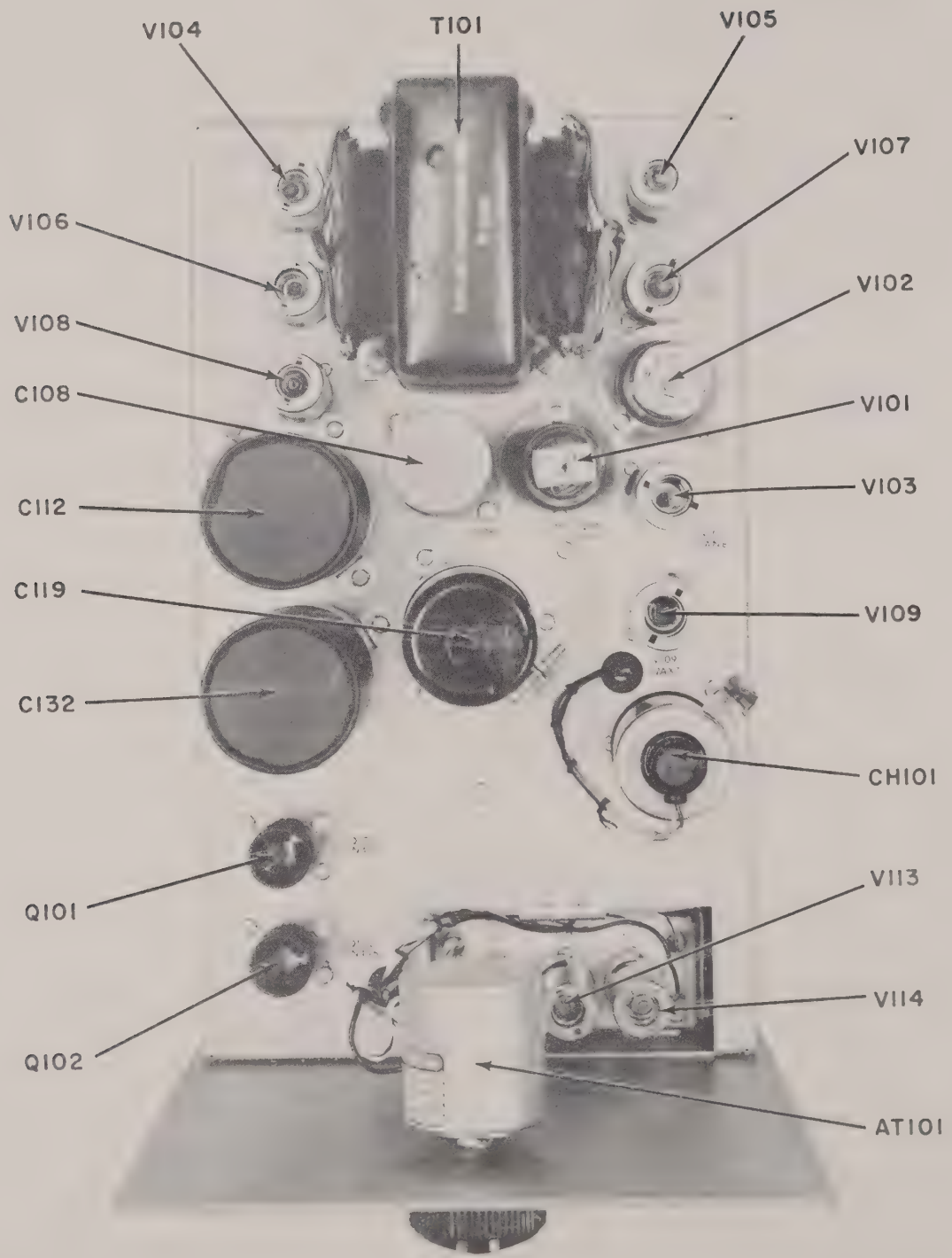


Figure 4-1. Noise Generator Chassis, Top View

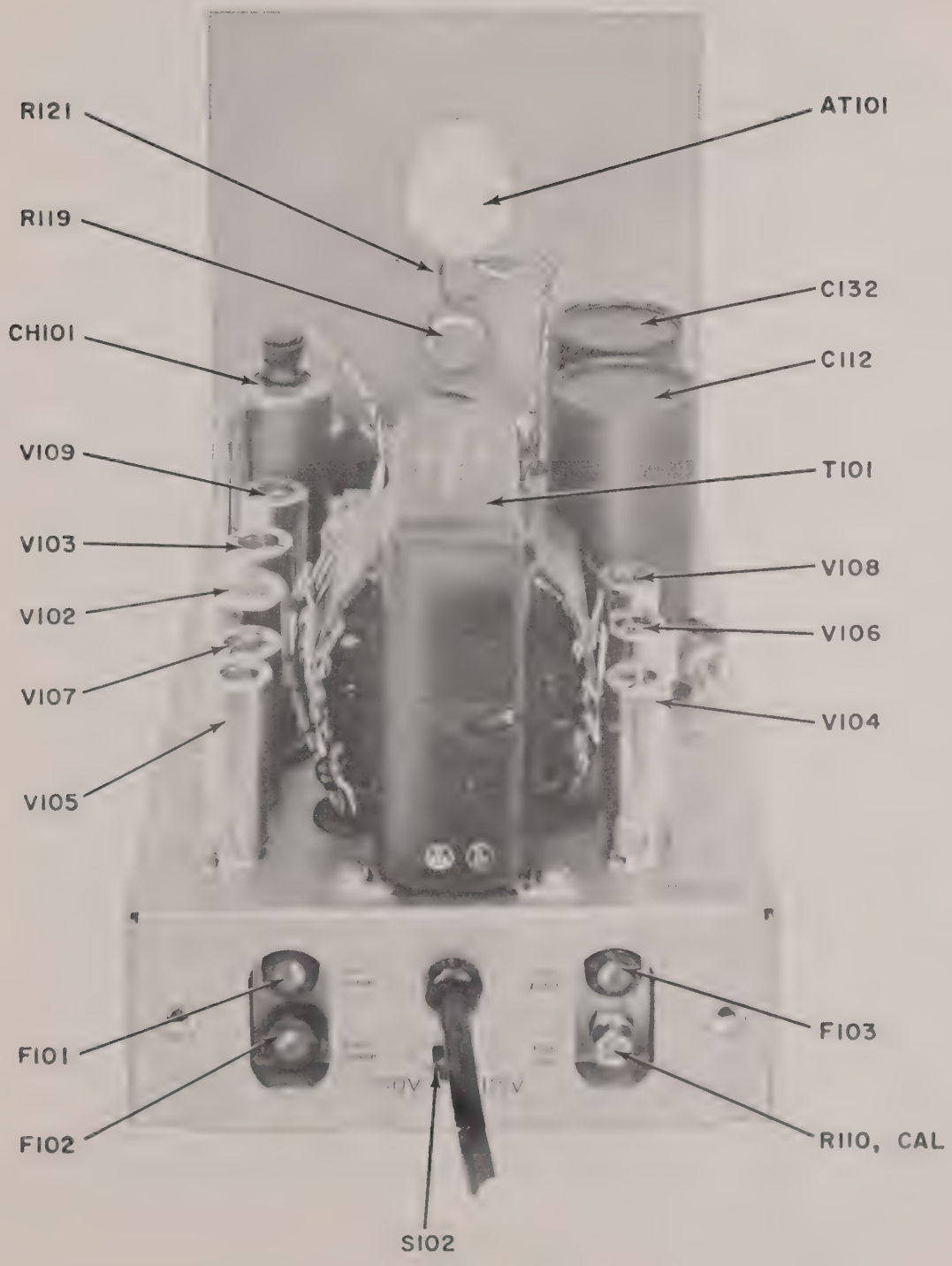


Figure 4-2. Noise Generator Chassis, Rear View

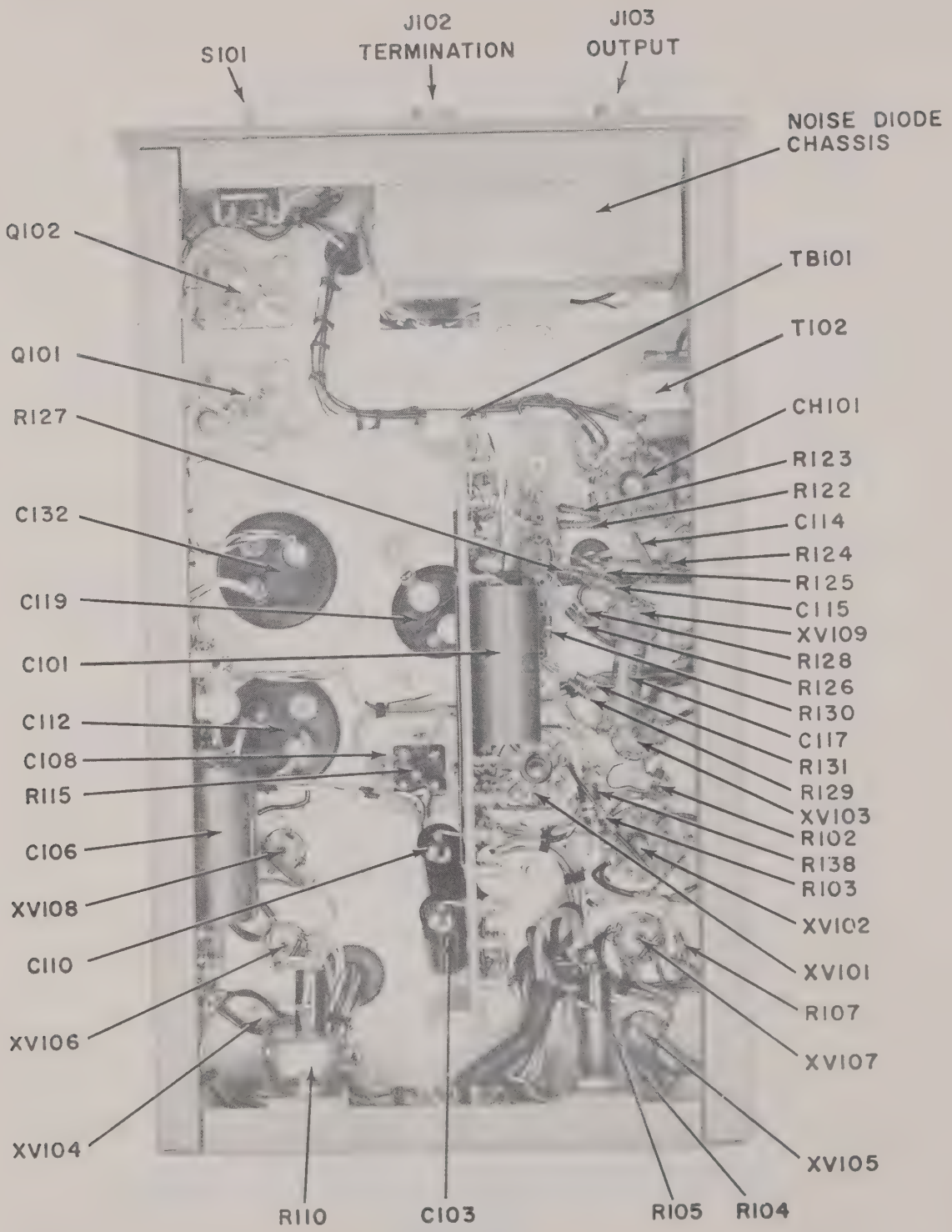


Figure 4-3. Noise Generator Chassis, Bottom View

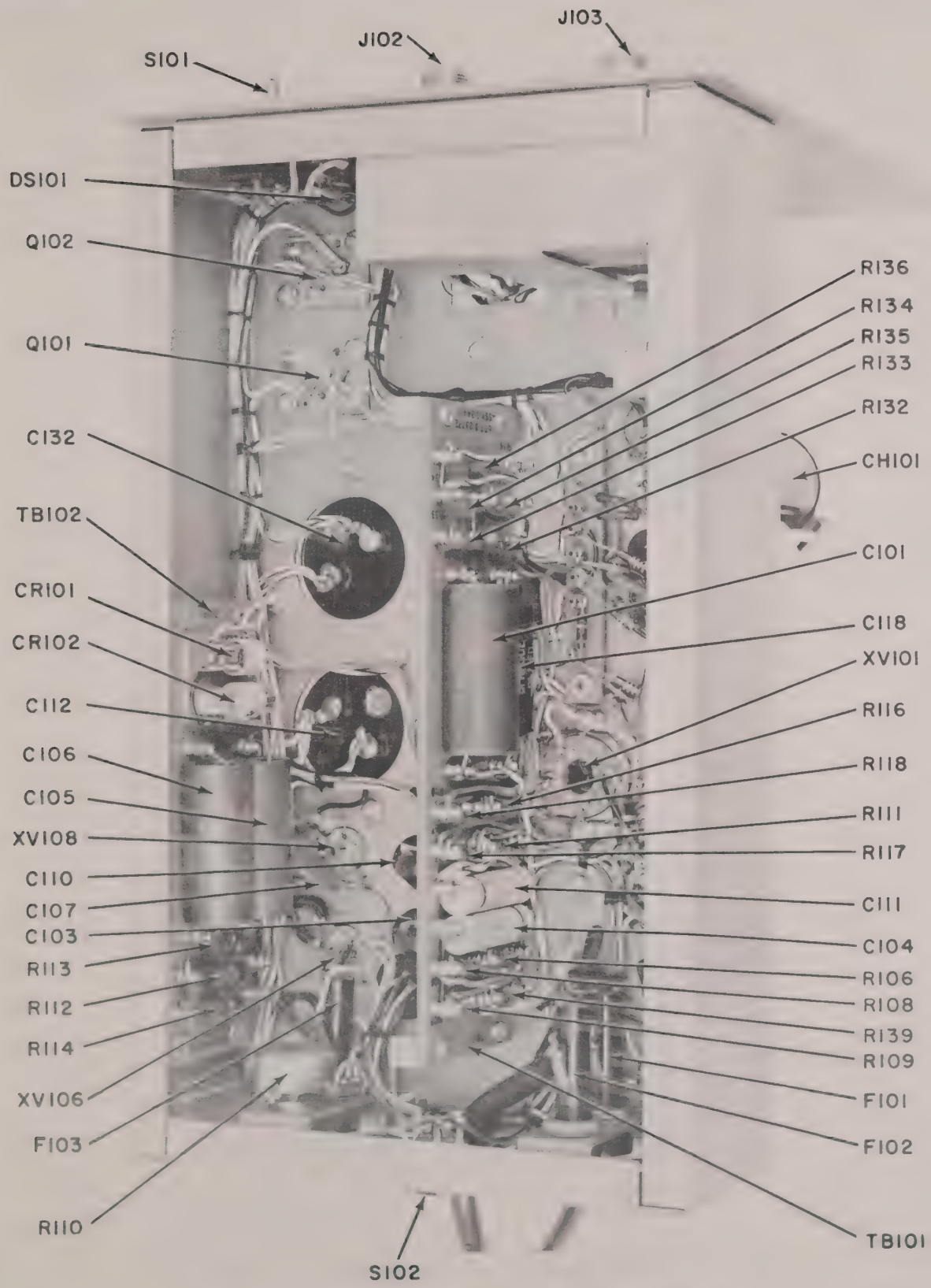


Figure 4-4. Noise Generator Chassis, Bottom Oblique View

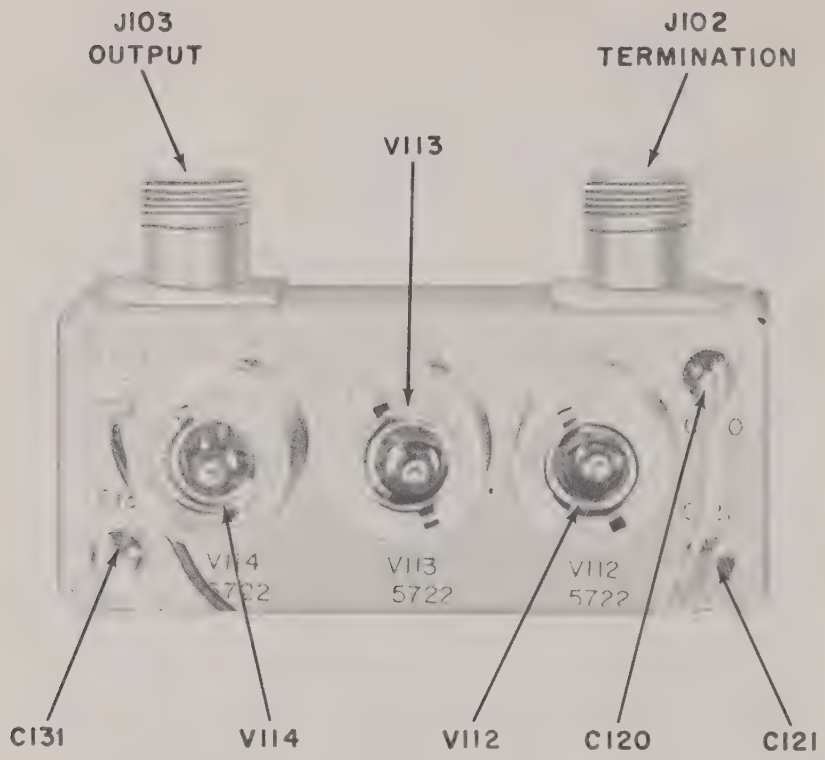


Figure 4-5. Noise Diode Chassis, Top View

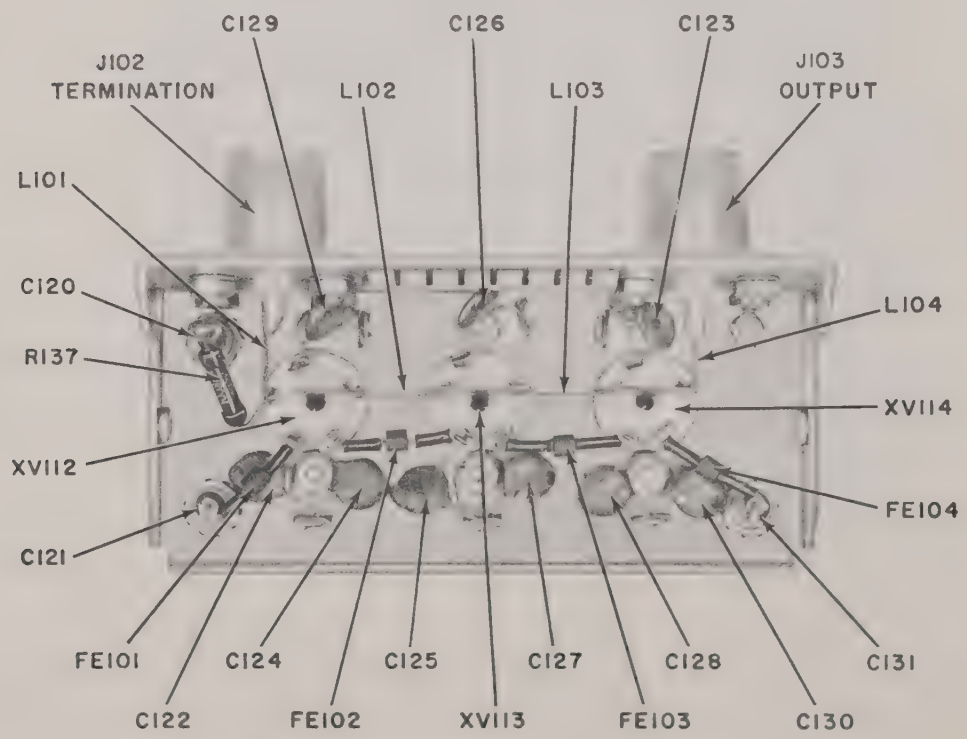


Figure 4-6. Noise Diode Chassis, Bottom View

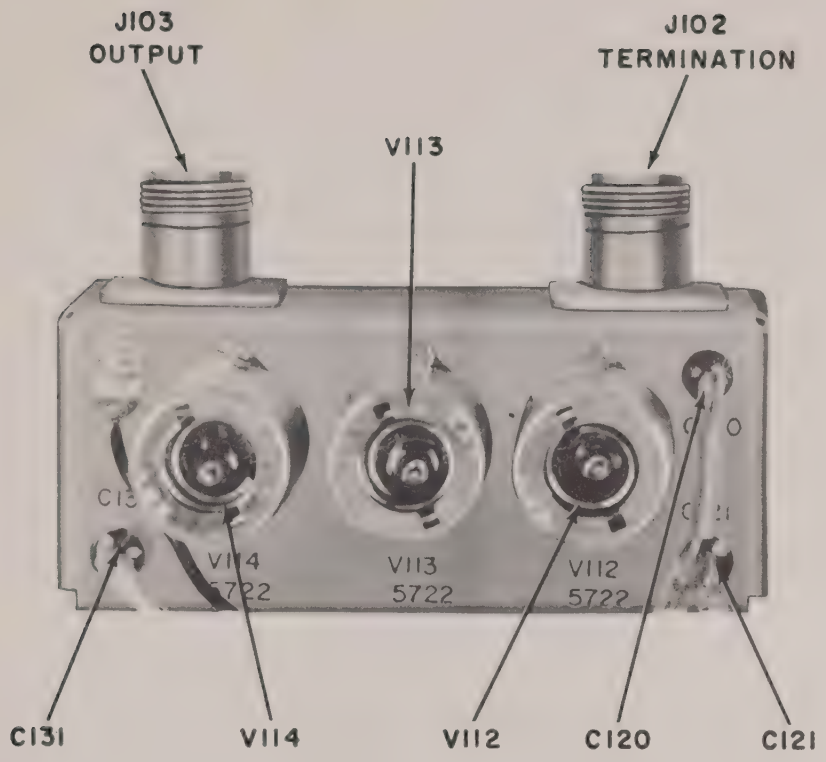


Figure 4-5. Noise Diode Chassis, Top View

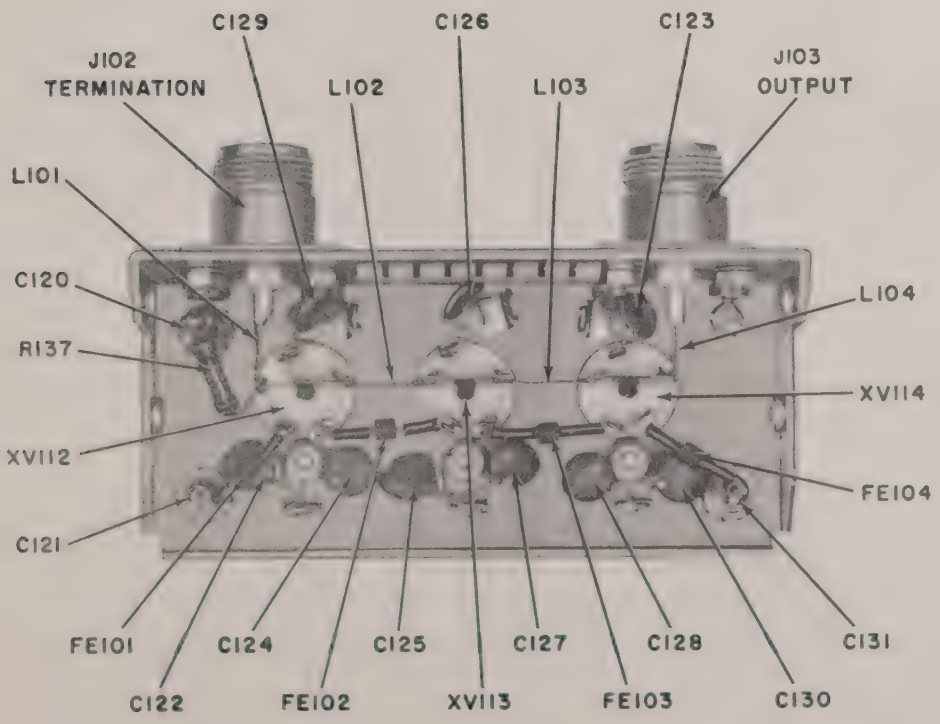
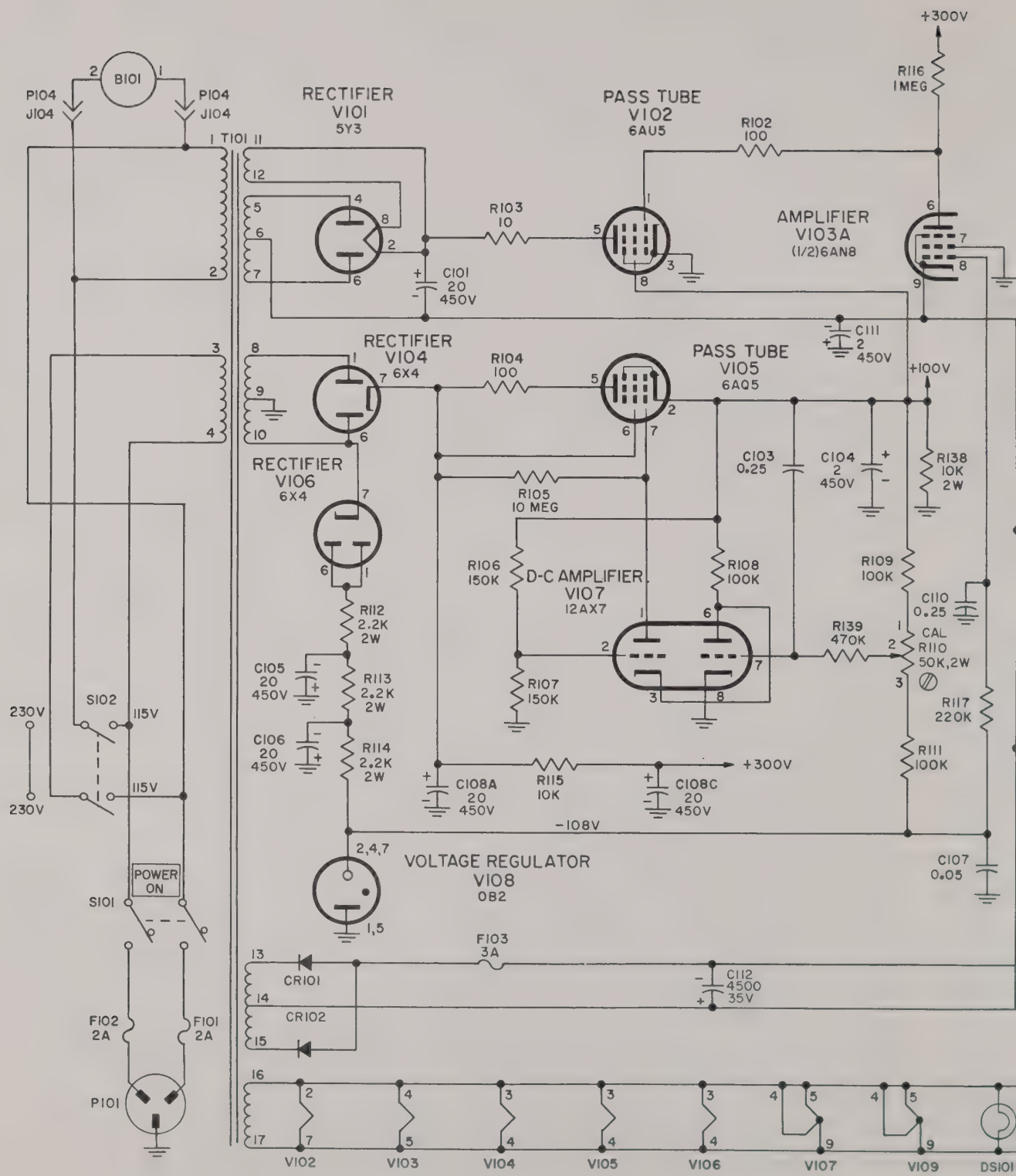
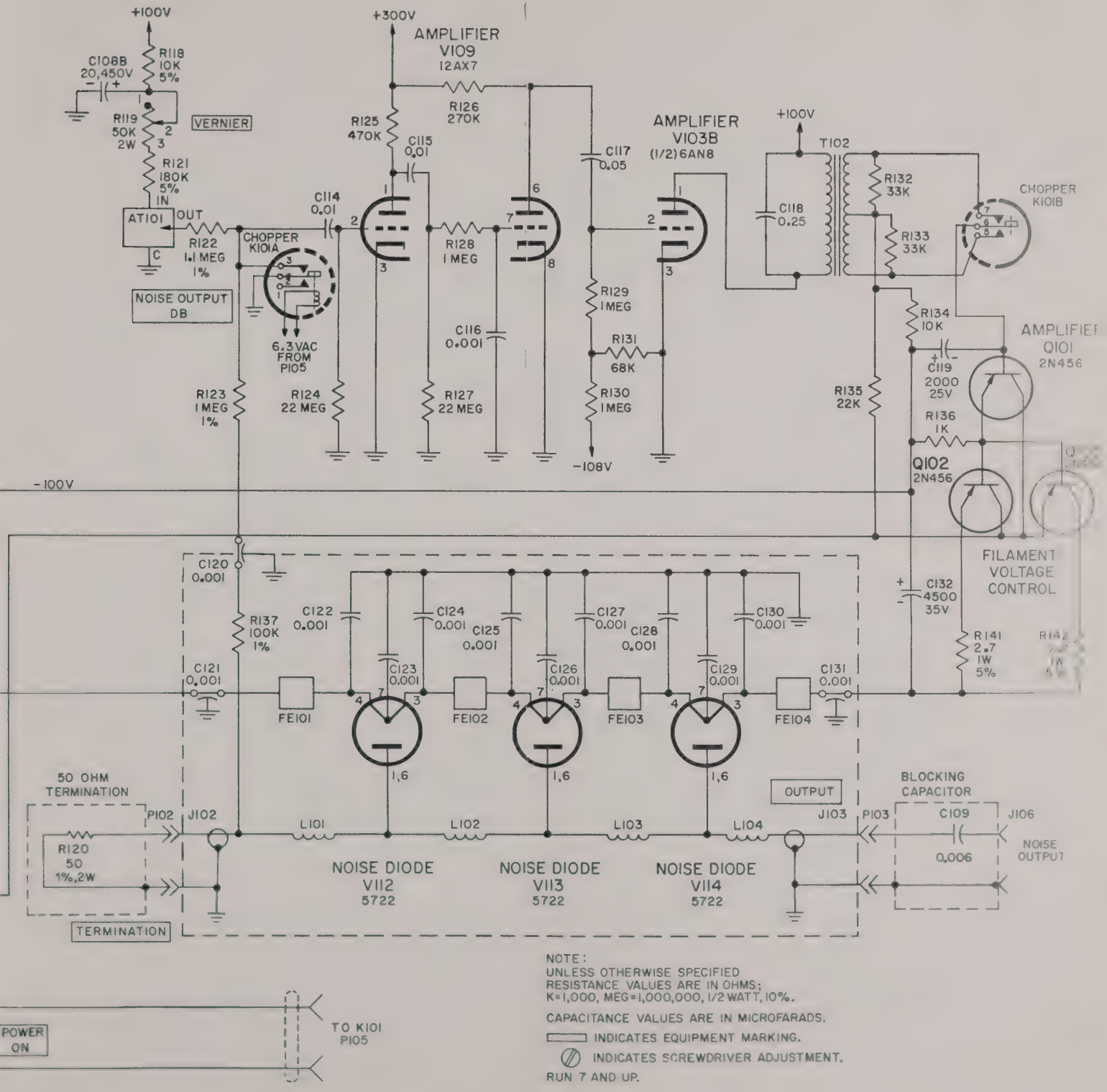


Figure 4-6. Noise Diode Chassis, Bottom View


+300V
B101
P104
J104
P104
J104
T101
RECTIFIER
V101
5Y3
PASS TUBE
V102
6AU5
R102
100
R116
1MEG
R103
10
C101
20
450V
AMPLIFIER
V103A
(1/2)6AN8
C111
2
450V
RECTIFIER
V104
6X4
R104
100
PASS TUBE
V105
6AQ5
+100V
C103
0.25
C104
2
450V
R138
10K
2W
RECTIFIER
V106
6X4
R105
10 MEG
R106
150K
D-C AMPLIFIER
V107
12AX7
R108
100K
R109
100K
C110
0.25
R139
470K
CAL
R110
50K,2W
R107
150K
R112
2.2K
2W
C105
20
450V
R113
2.2K
2W
C106
20
450V
R114
2.2K
2W
R117
220K
R111
100K
C108A
20
450V
R115
10K
C108C
20
450V
+300V
-108V
S102
230V
115V
115V
230V
POWER
ON
S101
VOLTAGE REGULATOR
V108
0B2
C107
0.05
F103
3A
CR101
CR102
C112
4500
35V
F102
2A
F101
2A
P101
V102
V103
V104
V105
V106
V107
V109
DS101



NOTE:
UNLESS OTHERWISE SPECIFIED
RESISTANCE VALUES ARE IN OHMS;
K=1,000, MEG=1,000,000, 1/2 WATT, 10%.

CAPACITANCE VALUES ARE IN MICROFARADS.

▭ INDICATES EQUIPMENT MARKING.

⊘ INDICATES SCREWDRIVER ADJUSTMENT.

RUN 7 AND UP.

Figure 4-7. Precision Noise Generator, Model N-1, Schematic Diagram

SECTION V
PARTS LIST

5-1. INTRODUCTION.

5-2. This parts list provides an alpha-numerical listing, in reference symbol sequence of the replaceable electrical, certain electro-mechanical, and mechanical parts of the equipment.

5-3. ORDERING INFORMATION. Orders for parts should contain the following information:

a. Equipment name and model.
b. Serial number.
c. Reference symbol of part.
d. Manufacturer's part number and code.

5-4. HOW TO USE THE PARTS LIST.

5-5. An explanation of the structure of the parts list, Table 5-2, and the meaning of the entries in the five columns are given in the following paragraphs. (See Figure 5-1.)

1 2 3 4 5 6 7

TABLE 5-2. PARTS LIST

SECTION VI
PARTS LIST

REF SYMBOL	DESCRIPTION	MANUFACTURER'S PART NUMBER	MFR'S CODE	MAINT QTY
C101	CAPACITOR, CERAMIC, 2000UUF, 10 PCT, 500WVDC /POLARAD PART NO. B704888	BCD-D1-4	FY	1
C102	NOT USED			
C103 AND C104	SAME AS C101			
S101 THRU S104	SWITCH, ROTARY, 4 SECT, 6 WAFERS, 6 POSITIONS	C23346	BE	1
TB101	TERMINAL BOARD, COMPONENT ASSY	C115625	BE	1
W108	CABLE ASSY, RF	C147158	BE	1
XF101 AND XF102	FUSEHOLDER/POLARAD PART NO. 005236	HKP-HW	EG	1
XV101 THRU XV106	SOCKET, ELECTRON TUBE	TS101P01	AU	1
V101	ELECTRON TUBE	6021	CK	2

Figure 5-1. Parts List Example

5-6. REFERENCE SYMBOL COLUMN. The reference symbol column (1, Figure 5-1) contains the reference symbol assigned to each part, which also identifies the part on the schematic diagram or in an illustration. The listing is in alpha-numerical order.

5-7. DESCRIPTION COLUMN. The description column (2) contains the description for each part. When the same part is used more than once in the equipment, the second and subsequent listings for that part use the phrase "SAME AS ___" (4) in the description column and the remaining columns (5, 6, and 7) are left blank. When a reference symbol designation has not been used or its assignment has been cancelled, the description column contains the phrase "NOT USED" (3).

5-8. MANUFACTURER'S PART NUMBER COLUMN. The manufacturer's part number column (5) contains the part number assigned by the manufacturer of the part, except for "SAME AS ___" and "NOT USED" listings.

5-9. MANUFACTURER'S CODE COLUMN. The manufacturer's code column (6) contains a letter code identifying the manufacturer of the part. Table 5-1 contains a listing of the letter codes and the manufacturers names and addresses.

5-10. MAINTENANCE QUANTITY COLUMN. The maintenance quantity column (7) contains the recommended maintenance quantity for each part, based on a one year requirement for an equipment in operation for 10 hours a day throughout the year. The recommended maintenance quantities will provide a high degree of equipment reliability in areas where an adequate supply of replacement parts is not available. The recommended maintenance quantity is listed for the initial occurrence of the part in the parts list, but covers all subsequent listings.

5-11. To determine recommended maintenance quantity for periods other than one year, multiply the one-year quantity by the desired period, expressed in years.

5-12. To determine recommended maintenance quantity for operating periods other than 10 hours per day, use the equation given below.

$$MQ' = MQ \times \frac{HR_{op}}{10}$$

where: MQ = Maintenance quantity from Table 5-2

MQ' = Maintenance quantity for desired operating period

HR_{op} = Operating period in hours

Round off the quantity obtained to the nearest whole number.

TABLE 5-1. MANUFACTURER'S CODE

CODE	NAME AND ADDRESS
B	Aerovox Corp., New Bedford, Mass.
D	Allen-Bradley Co., Milwaukee, Wis.
F	Amphenol Connector Division of Amphenol-Borg Electronics Corp., Chicago, Ill.
P	Centralab Division of Globe-Union, Inc., Milwaukee, Wis.
R	Cinch Mfg. Co., Division of United-Carr Fastener Corp., Chicago, Ill.
V	Dialight Corp., Brooklyn, N. Y.
Y	Erie Resistor Corp., Erie, Pa.
AJ	International Resistance Co., Philadelphia, Pa.
AP	Littelfuse, Inc., Des Plaines, Ill.
AU	Military Specifications
AV	Military Standards
BE	Polarad Electronics Corp., Long Island City, N. Y.
BH	Raytheon Co., Industrial Components Division, Industrial Tube Operation, Newton, Mass.
BN	Sprague Electric Co., North Adams, Mass.
BQ	Sterling Transformer Corp., Brooklyn, N. Y.
CD	Cutler-Hammer, Inc., Milwaukee, Wis.
CF	Cannon Electric Co., Los Angeles, Calif.
CK	Commercially Available Component
CN	Sarkes Tarzian, Inc., Bloomington, Ind.
CY	Mepco Division of Sessions Clock Co., Morristown, N. J.
DA	Continental-Wirt Electronics Corp., Philadelphia, Pa.
DK	Ferroxcube Corp. of America, Saugerties, N. Y.
DY	Chicago Standard Transformer Corp., Chicago, Ill.
DZ	P. R. Mallory and Co., Inc., Indianapolis, Ind.
EJ	Rotron Mfg. Co., Inc., Woodstock, N. Y.
FJ	Fastex Division of Illinois Tool Works, Des Plaines, Ill.
FX	Weston Instruments, Division of Daystrom, Inc., Newark, N. J.
HU	Arnold Stevens Co., Inc., Boston, Mass.
LP	Daven Co., Livingston, N. J.

TABLE 5-2. PARTS LIST

REF SYMBOL	DESCRIPTION	MANUFACTURER'S PART NUMBER	MFR'S CODE	MAINT QTY
	MODEL N-1 PRECISION NOISE GENERATOR			
AT101	ATTENUATOR,36DB/MODIFIED LP PART NO. P350M	A124863	BE	1
A101	MODEL N-1 NOISE GENERATOR ASSY	D124435	BE	1
A102	CHASSIS NOISE DIODE ASSY	C123781	BE	1
B101	FAN ASSY,AXIAL,115VAC,60CPS /MODIFIED EJ PART NO. VENTURI FAN	B702227	BE	1
CR101 AND CR102	SEMICONDUCTOR DEVICE,DIDOE /POLARAD PART NO. A702194	10LF	CN	10
C101	CAPACITOR,ELECTROLYTIC,20UF,450WVDC /POLARAD PART NO. C511358	TVA-1709	BN	1
C102	NOT USED			
C103	CAPACITOR,PLASTIC,0.25UF,20 PCT,200WVDC /POLARAD PART NO. B508732	160P25402	BN	1
C104	CAPACITOR,ELECTROLYTIC,2UF,450WVDC /POLARAD PART NO. C511351	TVA-1701	BN	1
C105 AND C106	SAME AS C101			
C107	CAPACITOR,CERAMIC,0.05UF,GMV,500WVDC /POLARAD PART NO. A710239	BPD-0.05	B	1
C108	CAPACITOR,ELECTROLYTIC,TRIPLE SECT,20UF, PLUS 50 PCT,MINUS 10 PCT,450WVDC,EACH SECT /POLARAD PART NO. C126770	17D19	BN	1
C110	SAME AS C103			
C111	SAME AS C104			
C112	CAPACITOR,ELECTROLYTIC,4500UF,PLUS 100 PCT, MINUS 10 PCT,35WVDC	32D414	BN	1
C113	NOT USED			
C114 AND C115	CAPACITOR,CERAMIC,0.01UF,20 PCT,1000WVDC /POLARAD PART NO. B705180	DD-1032	P	1
C116	CAPACITOR,CERAMIC,1000UUF,10 PCT,1000WVDC /POLARAD PART NO. A701560	DD-102	P	2
C117	CAPACITOR,PLASTIC,0.05UF,20 PCT,200WVDC /POLARAD PART NO. B508725	160P50302	BN	1
C118	SAME AS C103			
C119	CAPACITOR,ELECTROLYTIC,2000UF,PLUS 100 PCT, MINUS 10 PCT,25WVDC/POLARAD PART NO. A701873	HC2520A	DZ	1
C120 AND C121	CAPACITOR,CERAMIC,FEED-THRU,1000UUF,20 PCT, 500WVDC/POLARAD PART NO. A506409	327X5S102M	Y	1
C122 THRU C130	SAME AS C116			
C131	SAME AS C120			
C132	SAME AS C112			
DS101	LAMP,INCANDESCENT,6V,MIDGET FLANGE BASE	MS25237-328	AV	1

TABLE 5-2. PARTS LIST (CONT'D)

REF SYMBOL	DESCRIPTION	MANUFACTURER'S PART NUMBER	MFR'S CODE	MAINT QTY
FE101 THRU FE104	FERRITE BEAD/POLARAD PART NO. A115516	56-590-65/3B	DK	1
F101 AND F102	FUSE,CARTRIDGE,DELAY,2 AMP,3AG /MIL STD PART NO. MS90078-26/ /POLARAD PART NO. 518126	F02D2R00B	AU	10
F103	FUSE,CARTRIDGE,DELAY,3 AMP,3AG /MIL STD PART NO. MS90078-27/ /POLARAD PART NO. 518127	F02D3R00B	AU	5
H101	KNOB/POLARAD PART NO. 517211	70-3-2	BH	1
H102	KNOB/POLARAD PART NO. 517214	175-3-2	BH	1
J101	NOT USED			
J102 AND J103	CONNECTOR,RECEPTACLE,FEMALE,N TYPE /MODIFIED AU PART NO. UG-58/U	A123521	BE	1
J104	CONNECTOR,RECEPTACLE,FEMALE,3 PINS /POLARAD PART NO. AK50124	91-MPF3S	F	1
J105	CONNECTOR,RECEPTACLE,MALE,3 PINS, NON-REPLACEABLE PART OF K101			
K101	VIBRATOR,INTERRUPTER,DPDT /POLARAD PART NO. AK5656	C-11-11	HU	1
L101 THRU L104	COIL,RF,NON-REPLACEABLE PART OF A102			
P101	CONNECTOR,PLUG,MALE,3 PINS,WITH CABLE			
P104	CONNECTOR,PLUG,MALE,3 PINS /POLARAD PART NO. AK50123	91-MPM3S	F	1
P105	CONNECTOR,PLUG,FEMALE,3 PINS	MR3-15	CF	1
Q101 THRU Q103	SEMICONDUCTOR DEVICE,TRANSISTOR,GERMANIUM	2N456	CK	3
R101	NOT USED			
R102	RESISTOR,COMPOSITION,100 OHMS,10 PCT,1/2W /MIL STD PART NO. MS35043-7	RC20GF101K	AU	1
R103	RESISTOR,COMPOSITION,10 OHMS,10 PCT,1/2W /MIL STD PART NO. MS35043-1	RC20GF100K	AU	1
R104	SAME AS R102			
R105	RESISTOR,COMPOSITION,10 MEGO,10 PCT,1/2W /MIL STD PART NO. MS35043-37	RC20GF106K	AU	1
R106 AND R107	RESISTOR,COMPOSITION,150K,10 PCT,1/2W /MIL STD PART NO. MS35043-26	RC20GF154K	AU	1
R108 AND R109	RESISTOR,COMPOSITION,100K,10 PCT,1/2W /MIL STD PART NO. MS35043-25	RC20GF104K	AU	1
R110	RESISTOR,VARIABLE,COMPOSITION,50K,10 PCT,2W /POLARAD PART NO. 517853	JA2N056S503UA	D	1
R111	SAME AS R108			
R112 THRU R114	RESISTOR,COMPOSITION,2.2K,10 PCT,2W /MIL STD PART NO. MS35045-15	RC42GF222K	AU	1
R115	RESISTOR,COMPOSITION,10K,10 PCT,1/2W /MIL STD PART NO. MS35043-19	RC20GF103K	AU	1

TABLE 5-2. PARTS LIST (CONT'D)

REF SYMBOL	DESCRIPTION	MANUFACTURER'S PART NUMBER	MFR'S CODE	MAINT QTY
R116	RESISTOR,COMPOSITION,1 MEGO,10 PCT,1/2W /MIL STD PART NO. MS35043-31	RC20GF105K	AU	1
R117	RESISTOR,COMPOSITION,220K,10 PCT,1/2W /MIL STD PART NO. MS35043-27	RC20GF224K	AU	1
R118	RESISTOR,COMPOSITION,10K,5 PCT,1/2W /MIL STD PART NO. MS35043-111	RC20GF103J	AU	1
R119	SAME AS R110			
R121	RESISTOR,COMPOSITION,180K,5 PCT,1/2W /MIL STD PART NO. MS35043-141	RC20GF184J	AU	1
R122	RESISTOR,FILM,1.1 MEGO,1 PCT,1/1W	RN20X1104F	AU	1
R123	RESISTOR,FILM,1 MEGO,1 PCT,1/2W	RN20X1004F	AU	1
R124	RESISTOR,COMPOSITION,22 MEGO,10 PCT,1/2W /MIL STD PART NO. MS35043-230	RC20GF226K	AU	1
R125	RESISTOR,COMPOSITION,470K,10 PCT,1/2W /MIL STD PART NO. MS35043-29	RC20GF474K	AU	1
R126	RESISTOR,COMPOSITION,270K,10 PCT,1/2W /MIL STD PART NO. MS35043-218	RC20GF274K	AU	1
R127	SAME AS R124			
R128 THRU R130	SAME AS R116			
R131	RESISTOR,COMPOSITION,68K,10 PCT,1/2W /MIL STD PART NO. MS35043-24	RC20GF683K	AU	1
R132 AND R133	RESISTOR,COMPOSITION,33K,10 PCT,1/2W /MIL STD PART NO. MS35043-22	RC20GF333K	AU	1
R134	SAME AS R115			
R135	RESISTOR,COMPOSITION,22K,10 PCT,1/2W /MIL STD PART NO. MS35043-21	RC20GF223K	AU	1
R136	RESISTOR,COMPOSITION,1K,10 PCT,1/2W /MIL STD PART NO. MS35043-13	RC20GF102K	AU	1
R137	RESISTOR,FILM,100K,1 PCT,1/2W /POLARAD PART NO. B700977	9852-100K	FX	1
R138	RESISTOR,COMPOSITION,10K,10 PCT,2W /MIL STD PART NO. MS35045-19	RC42GF103K	AU	1
R139	SAME AS R125			
R140	NOT USED			
R141 AND R142	RESISTOR,COMPOSITION,2.7 OHMS,5 PCT,1W /MIL STD PART NO. MS35044-39	RC32GF2R7J	AU	1
S101	SWITCH,TOGGLE,DPDT/POLARAD PART NO. B703121	8373K7	CD	1
S102	SWITCH,SLIDE,DPDT	SW326	DA	1
TB101	TERMINAL BOARD,COMPONENT ASSY	C124411	BE	1
TB102	TERMINAL BOARD,COMPONENT ASSY	C124412	BE	1
TB103	TERMINAL BOARD	A124433	BE	1
T101	TRANSFORMER,POWER/POLARAD PART NO. B119033	ST3026	BQ	1
T102	TRANSFORMER,PULSE	A52C	DY	1

TABLE 5-2. PARTS LIST (CONT'D)

REF SYMBOL	DESCRIPTION	MANUFACTURER'S PART NUMBER	MFR'S CODE	MAINT QTY
V101	ELECTRON TUBE	5Y3	CK	2
V102	ELECTRON TUBE	6AU5	CK	2
V103	ELECTRON TUBE	6AN8	CK	2
V104	ELECTRON TUBE	6X4	CK	4
V105	ELECTRON TUBE	6AQ5	CK	2
V106	SAME AS V104			
V107	ELECTRON TUBE	12AX7	CK	4
V108	ELECTRON TUBE	0B2	CK	2
V109	SAME AS V107			
V110 AND V111	NOT USED			
V112 THRU V114	ELECTRON TUBE	5722	CK	6
XCR101 AND XCR102	HOLDER,SEMICONDUCTOR DEVICE	8200-02-01	FJ	1
XDS101	LAMPHOLDER,BAYONET SOCKET /POLARAD PART NO. A709943	101-3830-971	V	1
XF101 THRU XF103	FUSEHOLDER,EXTRACTOR POST TYPE,3AG /POLARAD PART NO. 005626	341001	AP	1
XK101	SOCKET,VIBRATOR/POLARAD PART NO. A701402	9663	R	1
XV101 AND XV102	SAME AS XK101			
XV103	SOCKET,ELECTRON TUBE	TS103P01	AU	1
XV104 THRU XV106	SOCKET,ELECTRON TUBE	TS102P01	AU	1
XV107	SAME AS XV103			
XV108	SAME AS XV104			
XV109	SAME AS XV103			
XV110 AND XV111	NOT USED			
XV112 THRU XV114	SOCKET,ELECTRON TUBE	SO-427-1	Y	1

TABLE 5-2. PARTS LIST (CONT'D)

REF SYMBOL	DESCRIPTION	MANUFACTURER'S PART NUMBER	MFR'S CODE	MAINT QTY
	SUPPLIED ACCESSORIES			
A103	TERMINATION ASSY	A123769	BE	1
A104	BLOCKING CAPACITOR ASSY	A124866	BE	1
C109	CAPACITOR,CERAMIC,6000UUF,20 PCT,500WVDC /POLARAD PART NO. A702287	CI-3	B	1
J106	CONNECTOR,RECEPTACLE,FEMALE,N TYPE, NON-REPLACEABLE PART OF A104			
P102	CONNECTOR,RECEPTACLE,MALE,N TYPE, NON-REPLACEABLE PART OF A103			
P103	CONNECTOR,RECEPTACLE,MALE,N TYPE, NON-REPLACEABLE PART OF A104			
R120	RESISTOR,FILM,50 OHMS,1 PCT,2W /POLARAD PART NO. A123765	C500D-50-1PCT	CY	1

POLARAD

POLARAD ELECTRONIC INSTRUMENTS

A DIVISION OF POLARAD ELECTRONICS CORPORATION

34-02 QUEENS BOULEVARD · LONG ISLAND CITY 1, N.Y. · AREA CODE 212 · EXETER 2-4500

REQUEST FOR MAINTENANCE

FROM:

COMPANY NAME _____ DATE: _____

ADDRESS: _____ INDIVIDUAL _____

_____ POSITION _____

SECTION OR DIVISION _____ PHONE NO. _____ EXT. _____

_____

EQUIPMENT _____ DATE OF PURCHASE _____

MODEL _____ SERIAL NO. _____ ORDER NO. _____

_____

TROUBLE REPORT:

A. Description of trouble _____

_____

_____

_____

_____

_____

B. Has trouble been localized? _____ If so, how and where: _____

_____

_____

_____

_____

_____

C. Instruments used and measurements taken, if any: _____

_____

_____

_____

D. Is trouble intermittent? _____

E. Hours of operation prior to this trouble _____

F. Date trouble occurred _____

G. Was factory consulted by telephone or letter prior to this request? _____

If so, give date and person to whom directed: _____

_____

H. Additional Comments: _____

_____

_____

_____

_____

_____

_____

When trouble develops requiring factory assistance, complete this form and send to:

Polarad Electronic Instruments
Division of
Polarad Electronics Corporation
34-02 Queens Boulevard
Long Island City 1, New York
ATTENTION: Service Department

After this report has been analyzed by the Service Department, you will be notified when a field service engineer will call on you to make the necessary repairs. If your trouble can best be corrected at the factory, we will so notify you with instructions and authorization for returning the equipment.

NO EQUIPMENT MAY BE RETURNED TO THE FACTORY WITHOUT WRITTEN AUTHORIZATION

POLARAD

WORLD LEADER IN MICROWAVE INSTRUMENTATION